



Places and Technologies 2015

# KEEPING UP WITH TECHNOLOGIES TO MAKE HEALTHY PLACES

Nova Gorica, Slovenia, 18.–19.6.2015

# PT2015

## BOOK OF CONFERENCE PROCEEDINGS

*A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and developing to their maximum potential.  
Health Promotion Glossary (1998)*



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**Editors:**

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Nova Gorica, Slovenia



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## **HEALTHCARE DESIGN REVISITED – NEW APPROACHES TO USER – CENTRIC, EFFICIENT AN EFFECTIVE DESIGN**

### **EXPERIENCES OF MILITARY MEDICAL ACADEMY (MMA) IN BELGRADE - 3 DECADES AFTER ITS FAMOUS DESIGN**

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### **ABSTRACT**

*The purpose of this paper is to reflect on the paradigm change and different experiences of using the healthcare design guidelines in the last 3 decades, through the case study of the Belgrade's Military Medical Academy (VMA).*

*Designed in 1973 after a large national competition, when architects Osojnik and Nikolić won the first prize, an extraordinary leaf shaped volume was raised in 1982 as the biggest healthcare center in former Yugoslavia. The 14-story building is covering 180.000 square meters of space on 21 hectares of land of Belgrade quarter of Banjica, divided in 60 different technical-technological entities. It represents still today one of the landmark and recognizable mega-architectural structure of the City of Belgrade. The most contemporary "state of the art" healthcare design guidelines were incorporated along with the most unusual interior design conceived as an U boat. More than thirty years after, its functional organization has been over passed and needs rethinking and upgrading. Its voluminosity and compactness represent major obstacles that need to be re-thinked. This paper presents an assessment of the healthcare design of the MMA. The paper has two parts. In the first part a specific set of criteria is defined based on theoretical research of strategies and documents, today's healthcare standards and norms. The second part provides a set of analysis through examining 3 types*





*of users: patients, medical staff and experts: architects and engineers. Some conclusions and ideas in form of guidelines for regeneration and improvement will be presented at the end of the paper.*

**Keywords:** *new standards for healthcare design; elements of psychological, physical, functional and aesthetic guidelines for today's healthcare design; user's satisfaction, change of paradigm.*

## **INTRODUCTION: HEALTH CARE DESIGN**

A century ago patients were still treated mainly at homes, and were sent to health care facilities only in exceptional cases. After years of building health and social care facilities during 20th Century, we face today consequences of cuts in government sending's: patients are offered to be treated at home, while their condition is monitored online.

Pavilion type of hospitals largely known from old pictures and movies were mainly used until the end of the XIX century, when the idea of all medical facilities working under one roof has been introduced. In 1907 in Chicago, a "monoblock" type of hospitals was firstly advocated<sup>1</sup>. The completely opposite idea from pavilion type of health care design founded in the era of tuberculosis showed its benefits but also needs some readjustments today. In this paper we will discuss this issues through analyzing monoblock design of one of the biggest hospital in Serbia ever built: the Military Medical Academy (MMA) in Belgrade.

The MMA was designed in 1973 – years characterized by magnitude in actions; after a large national competition was concluded with the first prize going to the architects Osojnik and Nikolić. An extraordinary leaf-shaped volume rose after almost a decade from its design, in 1982 as one of the biggest healthcare centers in former Yugoslavia. It is still one of the landmark and recognizable mega-architectural structures of Belgrade. A "state of the art" healthcare design guidelines were applied, as well as the unusual interior designed shaped as a "U boat". More than thirty years after, its functional organization has been changed and needs rethinking and upgrading. Its voluminosity and compactness represent major obstacles that need to be rethinking.

This research focuses on proposing possible design guidelines for upgrading and fine-tuning the monoblock type from 1970s to reach today's health care design standards. In doing so, we will also take into account the wider context - poor socio-economic situation in Serbia.

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<sup>1</sup> Vodička M. (1994). Bolnice, Zagreb, Školska knjiga.



## **HEALTH CARE IN YUGOSLAVIA**

First, we will enlighten the time when the MMA was built. Regarding planning documents from 1970s - healthcare and public health in Yugoslavia were deeply rooted in decision-making agendas of the time. After World War II a completely new central political planning system was introduced<sup>2</sup> as a consequence of socialist organization: the health institutions were under the full control of the central government with the majority of health care staff employed in the public sector. During the late 1970s, decentralization was slowly introduced but it was only in 1980s when the health system slowly changed its strict central political position alongside with introduction of multiparty parliamentarism and privatization. World bank has pronounced Yugoslavia as one of the 32 industrialized countries in the field of health care system development, while it could still benefit from European and UNDP funds as belonging to developing countries. The system was famous for free health care assurance.

The Socialist Federative Republic of Yugoslavia was consisted of 6 republics and 2 autonomy provinces that assured free health care to all its citizens - a sort of a rare and pioneer case. We can even say that it represented a preview for a system later known as a 'Scandinavian welfare system'. The level of social security and human dignity was elevated, while medicaments and health care were ensured for all.

In the frame of the general welfare system and socialist propaganda, the massive open competition for the MMA was announced. At that time, the Yugoslav Army was highly recognizable, since balancing smartly between the East and the West. By the early 1970s, the first propulsive years, the momentum for launching the mega project with a focus on new and completely modern design structure was achieved. At the symbolic level, it marked the years of greatness and importance. It seems that the health care was used as a highly political issue. Nevertheless, the benefit for citizens in general was enormous.

In the same year, 1973, another big medical center was launched with enthusiasm, this time in Ljubljana. These two centers still remain the biggest medical centers in the region. The countries of the region could not replicate these monumental medical buildings ever since today (having in mind the context of civil wars and slow reforms).

## **HISTORY AND ORGANIZATIONAL PATTERN OF THE MMA BUILDING**

The Military Medical Academy (MMA) has been designed as a medical, educational and scientific-research oriented institution. But speaking from today's

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<sup>2</sup> <http://eurpub.oxfordjournals.org/content/2/3-4/211>  
The European Journal of Public Health; Ed in Chief: Peter Allebeck: Primary Health Care in Yugoslavia.



paradigm: everything has changed since that period. MMA is now part of a much smaller in post-transition and severe recession country, with negligible role of the Army. However, the institution managed to maintain its international reputation in terms both of treatment and expertise of its medical staff. Within its modern building it represents also a great Medical School committed to creating further generations of military doctors. It is also recognized as a scientific research center of excellence. At the time of its launch, it was designed as the best possible version of the 'up to date', modern structure, both from the functional and the architectural point of view. MMA represents an example of a hospital built in characteristic "monoblock" type of hospital design of that era.<sup>3</sup> This type/principle of hospital design has both advantages and disadvantages, which is presented and analyzed in this paper, after examining the perceptions and beliefs of three types of its users.

The whole MMA complex has been designed large scale: the significantly large area of 21 hectares contains a large 180.000 sq. and the capacity of 1200 beds. The Military Medical Academy has even today 27 clinics and 17 institutes, the Specialist Outpatient Clinic, the Poison Control Center, the Emergency Department and the Solid Organ Transplantation Center performing more than 5000 diverse diagnostic and therapeutic procedures. The MMA operates today in completely different political circumstances but still as a part of the Ministry of Defense. Thanks to its persistent military organizational structure and commitment to providing the highest quality medical care, it has been rewarded and recognized as a medical institution meeting the top world standards. After its completion in more distant 1981 it became already one of the architectural symbols of Belgrade, both for its design and stature as well as position in health care system. One of the representing parameters of its greatness as mega project may be also the full number of its employment staff: over 3000. The significant change of new era represents the fact that it serves and is open today also for civilians/not only military families, two days per week in app. 40 % of its full capacity. Annually 600 000 people are examined, 30 000 are hospitalized and 20 000 of surgery interventions are done in this facility.

The building of MMA has a unique appearance (Figure 1, Figure 2) due to its exceptionally dynamic shape with four wings, colossal structure and horizontal stripe-like lines that dominate the façade. In the complex of MMA hospital there are several objects and big area of open green space including forest and parks. The main accommodation space is divided in two parts, in the basis it has the shape of a half cross-rounded at angles and is raised on to the columns, forming four powerful wings. Vertical communications including elevators and stairs are concentrated in the center of the building, as well as in north and south wing (Figure 3, Figure 4).

<sup>3</sup> Mitrović, M. (2012) *Arhitektura Beograda 1950-2012*, Beograd, JP Službeni glasnik.





1

2

3



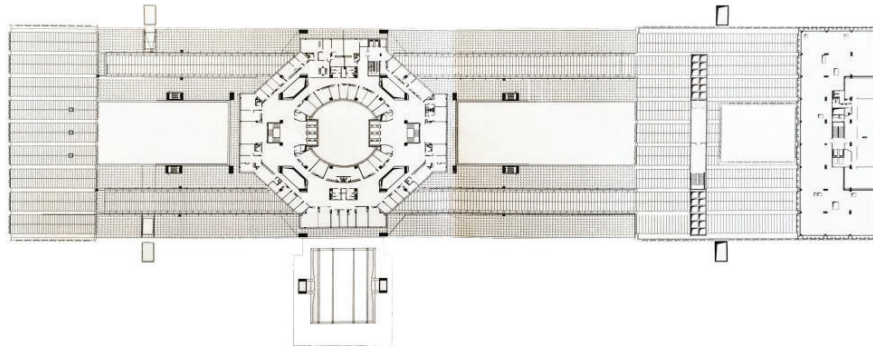
**Figure 1: Position of MMA in city landscape.**

(Source: <http://www.panoramio.com/user/996078/tags/Београд? photo page=2>).

**Figure 2: façade of the MMA hospital.**

**Figure 3: Floor organization of the MMA hospital.**

(Source: <http://vma.mod.gov.rs/en/about-mma/about-mma-building#.VTKSpUuKiFI>).



**Figure 4: Floor organization and communications of the MMA hospital.**

(Source: <http://vma.mod.gov.rs/en/about-mma/about-mma-building#.VTKSpUuKiFI>).

## NEW RESEARCHES

### **Evidence-based health care architecture (EBD)<sup>4</sup>: Searching for dignity**

The most important task for designers of health care development is to create a place where sense of human dignity could be preserved to the fullest extent. We have to try to reduce psychological constraints of patients, a sense of disorientation and fear acquired from the disease. Dignity health is making health care more accessible and more successful. Residents of all ages and backgrounds have to openly access by preserving dignity to primary care, preventive treatment, clinical support, chronic disease management, trauma services and a host of medical and

<sup>4</sup> EBD is a process used by architects, interior designers and facility managers in the planning, design, and construction of commercial buildings. An individual using “evidence-based design” makes decisions based on the best information available from research, project evaluations and evidence gathered from client operations.





therapeutic specializations. To encourage those most needed aspects, as professionals we already know the key elements: a lot of natural lights & fresh greenery, warm colors, “homey” entourage, peaceful and comfort and private spaces that reflect confidentiality. The general conclusion is that the new 21<sup>st</sup> century approaches need much more than just ordinary and plain health care. New patients’ needs are more and more complex and multilayered.

To reach further knowledge, architects and designers have been fully aware that evidence-based design incorporates specific design principles that have been elaborated to improve clinical and satisfaction outcomes for patients and staff. The Center for Health Design defines evidence based design as the process of basing decisions about the built environment on credible research to achieve the best possible outcomes. Evidence-based health care architecture creates safe and therapeutic environments for patient care and encourages fully family involvement. It promotes efficient staff performance and is restorative for workers under stress. This type of design ultimately improves the organization’s clinical, economic, productivity, satisfaction and cultural satisfaction. The health care environment has to enhance the dignity of the patient through features that allow primarily privacy and confidentiality.<sup>5</sup>

Research has defined key hospital design goals as: patient-centered care (since the patient is the hospital’s reason for being), efficient operations, clinical safety, optimal functional relationships, modern systems, flexibility for expansion and adaptation, implementation of new technology. Sustainable design requires also reduced energy usage and pollution control and overall design that reduces stress including art and hospitality, not only science and technology<sup>6</sup>.

The facility conveys a message to patients, visitors and staff about the organization and the medical care being provided there starting with the approach to the facility, the drop-off area, the parking lots and the street signs. Ideally, that message should be welcoming, caring, showing comfort and compassion, commitment to patient well-being and safety. Stress should be relieved, safety net provided, respect reciprocated, competence symbolized, way-finding facilitated and families - accommodated. The physical space of the institution also influences employee service attitudes and behaviors.

In recent years, nearly all healthcare design work in developed countries has been in some format of integrated and collaborative process. Collective “ownership” of the design challenge and the solution is an empowering tool. Healthcare architecture accommodates interaction between medical staff and people in need of care; therefore this research has mainly collaborative and participatory character,

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<sup>5</sup> Shaller,D.(2007) *Patient – centered care: What does it take?*

<sup>6</sup> Sprow,R. (2012) *AIA Planning Hospitals of the Future.*



since guidelines given in the results are mainly and primarily based on user satisfaction and we would add – human dignity.

MMA has been planned during 1970s and finished in 1980s – era still oriented and defined mainly by functionalism of Post-modern movement. Patients were treated in a different way that led to health care facilities with sometimes weak relation to everyday life. Some of the weaknesses of such hospitals are: lack of privacy, connection, orientation, etc.<sup>7</sup>. USA, for example, is currently working on a project of 180 billion dollars investment in hospital re-construction; re-adjusting aging facilities (built in 1950s and 1960s) that no longer support efficient and safe cares delivery. Modern principles of hospital design include patient and family centered care<sup>8</sup>.

Rational and smart design of guidelines is essential in the case of Serbia and its poor financial means. We will build upon the existing knowledge stating a strong link between the design of health care facilities and perceptions and beliefs of patients, medical staff and concerned families. Starting from this assumption, we will examine patients, staff and designers / architects of MMA in order to learn more about the building and its use.

Considering new approaches in design we have to focus primarily on stress reduction as a main factor of disorder. For that we need the results of investigation - opinions of users but as well of designers. Mainly; psychologically, as designers we have to obtain several focal points in order to achieve better health care design:

1. Social support (patients, family, staff)
2. Control (privacy, choices, escape)
3. Positive distractions (artwork, music, entertainment) and
4. Nature (plants, flowers, water, wildlife, nature sounds).

It is easy to observe upon the analyze at first glance - of our case study: MMA entirely miss 3.th and 4.th point: positive distraction and involvement of nature. How can we improve it in poor socio-economical frame? How can we choose priorities? The proposal of some possible guidelines represents a focal point of this research.

## **METHODOLOGY**

The methodological framework used in this research consists of: literature review shown in the chapter above and the analysis of in-depth interviews and returned questionnaires with patients, medical staff and experts-engineers working at the MMA. Under that scope the quality assessment of the MMA hospital in order to provide clear criteria for evaluation could be define as below:

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<sup>7</sup> Wagenaar, C. (2010) Architecture and health, Symposium.

<sup>8</sup> Levin, D. and Joseph, A. (2009) The center for health Design, Planning, Design and Construction of health Care Facilities, Second Edition, USA.



## **Defining criteria for assessment**

Based on the principles of good hospital design, we have centered our research interest primarily on user's experience, by making use of previous research of principles, strategies and documents, as well as analysis of observations and interviews done in the complex. Assist. Jelena Marić, one of the authors of this research accomplished the part concerning observations, interviews and questionnaire analysis.<sup>9</sup> Assessment criteria's are divided in two: A. Physical and functional criteria and B. psychological and aesthetic criteria.

### **A Physical and functional criteria**

#### **Outdoor design**

The site/location: This criterion is defined by the hospital position and the connection with the urban tissue of the city. Large hospitals like MMA should be located in peaceful parts of the city away from traffic and noise, but easily accessible from every part of the town<sup>10</sup> not only for patients but also for everyday users like medical staff and other employees. Providing access convenient both for community and service vehicles, with paved roads and accessible entrances that are well-marked, available parking lot and green areas & open spaces are the key elements of good design. Other criteria in this part especially important for MMA hospital could be defined as: building capacity, workforce shortages, new technologies, etc.

#### **Indoor elements**

Many sustainable design features can be incorporated into health care facility design including energy and water consumption and conservation, nontoxic materials and finishes, sustainable operations and maintenance, as well as environmental pollution control and flexibility & adaptation to climate change. Flexibility is an essential part of the design, since the technologies as well as needs are rapidly changing. Functionality means adaptation to changing needs of users.

Adaptation to climate change (the resilience factor) is of great importance in locations such as Belgrade where a potential for floods, earthquakes and other natural disasters is high. Planning and design shall consider the need to protect the life safety of all health care facility occupants and the potential need for continuing services following such a disaster. For those facilities that must remain operational

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<sup>9</sup> Ass. arch Jelena Marić interviewed in this research a total of 100 patients, 50 medical staff members and 3 experts designers, one from the original period of MMA building - which were surveyed through listed criterions. This investigations represent the anex of this research.

<sup>10</sup> Balzareno, D. (1997) *Programiranje, projektovanje i izgradnja bolnica*, Beograd.



in the aftermath of a disaster special design is required to protect systems and essential building services such as power, water, medical gas systems and air conditioning.

Users are naming these factors as significant for their overall experience: air conditioning, amount of natural light and fresh air, easy access to green and open spaces in the hospital complex, internal communications, adequate room equipment and security.

## **B. Psychological and aesthetic criteria**

### Psychological criteria

Good design in the health care facility starts by recognizing the basic functional needs but does not end there - it must also meet the emotional needs of those who use such facilities at times of uncertainty, dependency and stress.

The psychosocially supportive design or healthy workplace design is one of the biggest challenges for architects and designers. Having a great impact on people's motivation, creativity, state of mind and general well-being it can also influence the physical healing process. This is explained by the fact of synergy: how the individual interprets the perception of stimulation and how one experiences impacts to one's environment<sup>11</sup>. Earlier research in environmental psychology and need has shown that architectural dimensions such as stimulation (intensity, variety, complexity, noise, light, odor, color, crowding, visual exposure, proximity to circulation), coherence (organization, thematic structure, pathway configuration, distinctiveness, floor plan complexity, circulation alignment, exterior vistas), control (crowding, boundaries, climatic and light controls, spatial hierarchy, territoriality, symbolism, flexibility, privacy, depth, interconnectedness, functional distances, focal point, furniture arrangement), and restoration (minimal distraction, stimulus shelter, attraction, solitude) - are closely linked to the perception of psychological well-being or stress.<sup>12</sup> The detailed architectural and interior design philosophy of the hospital needs to start with this feeling of hospitality and of providing a link to nature and the world beyond. The facility design has to provide a safe & comfortable environment and reduce stress and confusion for patients, families, and staff. Natural sounds, especially water have a calming, relaxing effect and effectively mask other undesirable noise. Music, which stimulates the body's release of endorphins and lowers heart rates can have similar positive results. Classical music played in operating suites has been shown to lower patient anxiety and even reduce the need for anesthesia. People are shown to heal faster and feel

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<sup>11</sup> Antonosky, A. (1979). Health, Stress and coping: new perspectives on mental and physical well-being. Jossey-Bass, San Francisco.

<sup>12</sup> Dilani, A. (2007) A New Paradigm of Design and Health.





better and are reduced anxiety, naturally comfortable in smaller communities that they can relate to.<sup>13</sup>

Color is an essential element of visual stimulation with well-documented psychological and physiological effects. Warm colors especially when accompanied by high illumination levels have been found to encourage activity, while cool colors promote more passive behavior. Based on this and user experience from MMA hospital we can extrude several indicators for psychological criteria such as: noise, safety, comfort, floor plan complexity, intimacy (acoustic and visual privacy), cleanliness, exterior vistas, fresh air and daylight.

#### Aesthetic criteria

An aesthetically pleasing facility is a key aspect of the perceived quality of care. Pleasantness of décor could be measured through users' perception of beauty and harmony of building itself, material and textures, colors, landscape / green areas, etc. Good design will create a mental map, which means we can remember architectural environments for long time in our life. Our memory will be triggered to place and design when we see a landmark or attractive design that seems familiar to our attention and mental process.

Facility design and elements of the indoor environment contribute to real and perceived quality of care measurements, as defined by the Centers for Medicare & Medicaid Services (CMS)<sup>14</sup>.

### **RESULTS – USERS EVALUATION**

In this chapter the results from the users-experience evaluations are analyzed and presented. The research was conducted in two parts. A total of 100 patients, 50 medical staff members and 3 experts were interviewed, which represents over 10% of total patients and employees number. Interviews were semi-structured in the way to learn more about the interviewee's perceptions and beliefs on main advantages and disadvantages of design and their overall experience of the MMA hospital.

#### **Patients' experiences**

Interviewed patients are mainly satisfied with comfort, hygiene, privacy and modern design of the MMA hospital especially in comparison to other healthcare facilities in Belgrade and wider in Serbia. However, as a main problem patients have listed the complexity of floor plan and inner communication, as well as an outdated, confusing and subtle signs for directions. Way finding for patients and

<sup>13</sup> Lombard, J and Brown, S. (2010) Designing for Health and Well-Being, AIA.

<sup>14</sup> <http://www.cms.gov/>



their families is an uncomfortable and complex challenge. Patients often seek for help from medical staff for directions inside the building, which represent a significant problem for the work of the institution. Although every room has windows offering daylight and a view on green landscape and forest; a significant problem represents a lack of fresh air, places for recreation, connection with nature and access to open green spaces.

### **Medical staff experiences**

During the interviews medical staff has shown great emotional connection with the working space and the MMA building in general, due to its aesthetic and functional characteristics but also due to time spent in hospital and the nature of their work. Considering volume of this monoblock hospital system medical staff argued both advantages and disadvantages. One of the main potentials is that this type of hospital has many sectors under the same roof and the fact that patients can solve complex medical problems in one building. On the other hand big capacity leads to many problems like crowding - due to lack of organization in parking lots and inner vertical communication since all employees are arriving to work at the same time. The elevators are shared for medical staff and patients. This is recognized as an important problem especially for staff working at higher floors. Lack of daylight in horizontal communication and long hallways, offices mostly without natural light, lack of oxygen and temperature differences between indoor and outdoor spaces are all stated as factors affecting work efficiency of the staff.

### **Expert observation**

Many of specific data used in this research is gathered from experts-engineers working in the Sector for Logistics in the MMA. This sector is charged with providing material and technical support for all organizational units in the MMA, as well as creating favorable conditions for employees and patients. Here are some of the advantages from their perspective: air conditions are using fresh air and providing equal temperatures in whole facility; all technical systems are working under proper mechanical maintenance; new technologies are applied in medical treatments and diagnostic procedures; spaces in the building have great flexibility regarding possibility for adaptations and re-use. The experts also name the disadvantages: the complete renovation (needed every 30 years) is currently impossible because of the volume and the capacity of the hospital as well as a poor socio-economic frame; there is a significant shortage in staff for 24/7 maintenance of systems in building; there is an enormous amount of energy consumption thanks to outdated substation, lighting system and heat insulation; as well as significant problems of communications inside the hospital - horizontal and vertical; vast green spaces in the complex of the MMA are not enough put in use, etc.

In the second part of the research a total amount of 50 patients and 50 employees were asked to answer a questionnaire. All level of users were asked to evaluate



MMA design with a grade from 1 to 5 (1 being the lowest, and 5 being the highest grade) for each criteria, where <sup>15</sup> is based on their own perspective. In the table below (Table 1), all “satisfaction scores” have been presented. These results are showing the critical areas and main problems of the MMA, which are the complex floor plan and inner communications, shortages of fresh air and daylight, great amount of energy consumptions and lack of connection and usage of open green spaces.

**Table 1: List of criteria for assessment and users “satisfaction scores”.**

CRITERIA	SCORES 1-5			CRITERIA	SCORES 1-5		
	patients	staff	experts		patients	staff	experts
<b>Physical and functional</b>				<b>Psychological and aesthetic</b>			
site/location/connections	4	4	4	Human character	4	3	2.5
parking lots/entrances and accessibility	3.5	3	2	Intimacy (acoustic and visual privacy)	3	3	4
greenary and open spaces	3	4	5	Emotional connection	3.5	4	4
building capacity		4	5	comfort	4	4	4
workforce shortages		3	3	noise	4	4	4
new tehnologies in medical treatments		4	5	fresh air and daylight	2	2	3
energy consumption		2	1	safety	4	5	5
water consumption		4	4	floor plan complexity	2	4	4
nontoxic materials			4.5	exterior vistas	4	5	5
environmental pollution			4	beauty of the building	5	5	5
flexibility		4	4.5	harmony	4	4	4
adaptation to climate change		4	4	material and textures	4	4	5
air conditioning	2	2	4	colours	4	4	5
natural lighting	2.5	3	3	landscape	4	5	5
access to grean and open spaces	2	3	3				
internal communications	2.5	3	3				
room equipment	4	4	4				
security	5	5	4				
Overall user satisfaction	3.2	3.5	3.7	Overall user satisfaction	3.7	4.0	4.3

Based on a previously presented research concerning modern principles in health care design and the analysis of interviews and questionnaires we tried to develop a set of specific guidelines for future improvements of the MMA hospital that we wish to present in this chapter. Participants, sharing their perceptions and experiences were also given a chance to present their views and beliefs on possible improvements, that we have also included in our conclusions.

<sup>15</sup> There are some criteria/questions that are specifically made for only one category of users regarding their competence for an adequate answer.



Most of the disadvantages are emerging from the volume of the building itself that affects the general disorientation and hopeless feeling of the patients. While patients state that the floor plan too complex, staff and experts have a different opinion. Perception collides also in the case of the lack of greenery highlighted by the patients but largely ignored by staff and experts. All three groups are pretty unsatisfied with the poor air conditioning system and the lack of natural lighting. Internal communications are in the greater sense perceived as too long by the group of patients. All three groups perceive the lack of fresh air as main obstacle.

We have also observed the rankings of satisfaction with the humane character of the hospital, visual and acoustic privacy and the emotional connection with the hospital and on a scale from 1-5 it has been ranked with a grade 3. This is where we also see the space for improvements. All of three groups believe there should be an open access to patios in the middle of the building and to greenery – which would be possible only by re-adjusting the landscape design. Finally, security seems to be the best aspect of this building which is rather understandable for a military oriented building with strong hierarchal relations.

#### **CONCLUSION & GUIDELINES FOR POSSIBLE IMPROVEMENTS**

The set of proposal of possible guidelines for improvements of the MMA could be introduced as:

- Reducing energy consumption is possible through several interventions. First, by using new or improved technologies such as replacing old substation, providing heat insulation in every part of the building and implementing new lighting system. Second, through using renewable energy resources such as sunlight. Experts working in the MMA are strongly supporting this idea and are working on improving the possibilities for implementing specific solar panels;
- Providing possibilities for direct usage of fresh air through several interventions: First, window opening in some areas of the building, that could increase the feeling of having a fresh air and increase the level of oxygen in crowded places. Second, releasing fresh air into the entrance halls would reduce the differences between indoor and outdoor temperature caused by constant air conditioning;
- Introducing spaces for different recreational activities that could reduce anxiety and stress of patients and medical staff. We could think of a library or lounge in the nature; or indoors walking area and wellness center. This could be done in the building itself, but also in the outdoor areas of the MMA hospital;
- Providing better and more modern usage of open green spaces that are already a part of the MMA hospital complex;
- Communications inside the hospital are proven to be a big obstacle for patients and families. Rethinking patient flow in hospitals is necessary.





Way finding is much more than signs consequently a stronger management concern for the user's experience is needed, meaning that endless standard signs has to be replaced by more informational, more interactive systems with neon colors. In this case every Clinique would have personal characteristic color which would ease way finding for patients and families not familiar with the hospital organization;

- Reducing time that staff is spending in parking lot and elevators could be dealt in several ways. First employees should be able to enter parking lot without the ticket, and secondly - separate elevators for staff and patients could contribute to reducing crowd problems;
- Implementing strategy for periodical renovation or "floor to floor" renovation could be a possible solution; in the case a complete renovation of the hospital is not possible.

These guidelines could significantly change the overall user's experience in this hospital and could be included into the strategies for development other "monoblock" type hospitals with similar characteristics and surrounding.

As a possible continuation of this study, we foresee research on design interventions that improve safety, workflow, efficiency and time spent in direct care. As a place dedicated to health, a hospital building must first be a healing, life-affirming space that plays an active role in helping patients and their families return to the health status. Hospitals of the future will need to re-adjust to emerging trends: higher patient acuity, shorter stays, and aging patients.

For rational and easier re-adjustment of the MMA facility in the time of crisis, we could think of financial models such as private public partnerships (PPP) funds and organization. In order for this model to be put in use, a strong rule of law and anti-corruption legislation is needed. To wrap this up, patient-centered design is just one side of the coin. Free healthcare from corruption and bribe are equally important parts for human dignity dimension of the health care system.

## REFERENCES

- Antonovsky, A. 1979. *Health, stress, and coping*. Jossey-Bass, San Francisco.
- Balzareno, D. 1997. *Programiranje, projektovanje i izgradnja bolnica*, Beograd, 5-31.
- Bozovic - Stamenovic, R. 2010. *Healing Factor in Housing Design for Elderly – Singapore Paradigm for the Future. Design, Technology Refurbishment and Management of Buildings (IAHS)*, 227.
- Dilani, A. 1999. *Healthcare buildings as supportive environments*. World hospitals and health services: the official journal of the International Hospital Federation, 20-26.



Dilani, A. 2007. *A New Paradigm of Design and Health*.  
Accessed March 20, 2015.

Dilani, A. 2008. *Psychosocially supportive design: A salutogenic approach to the design of the physical environment*, Design and Health Scientific Review, 47-55.

Guidelines for the Design and Construction of Health Care Facilities by the Facility Guidelines Institute, 2010.  
Accessed April 5, 2015, <https://tiduteba.files.wordpress.com/2014/06/building-type-basics-for-healthcare-facilities.pdf>.

Kliment, S. 2000. *Building Type Basics for Healthcare Facilities*. New York: John Wiley & Sons, Inc.  
Accessed April 1, 2015, <https://tiduteba.files.wordpress.com/2014/06/building-type-basics-for-healthcare-facilities.pdf>.

Levin, D. and Joseph, A. 2009. *The center for health Design, Planning, Design and Construction of health Care Facilities*, Second Edition, USA.

Levi, L. 1979. *Psychosocial factors in preventive medicine in Healthy people. The Surgeon General's report on health promotion and disease prevention. Background papers*. Washington: Government Printing Office, 207-53.

Lombard, J and Brown, S. 2010. *Designing for Health and Well-Being*, AIA,  
Accessed March 21, 2015, <https://www.youtube.com/watch?v=e7mlaiVovFw>.

Mens, N., and Wagenaar, C. 2014. *Health care architecture in the Netherlands. Hospitals*, 1750, 12.

Mitrović, M. 2012. *Arhitektura Beograda 1950-2012*, Beograd, JP Službeni glasnik, 137-139.

Shaller, D. 2007. *Patient – centered care: What does it take?*  
Accessed March 22, 2015, [http://www.commonwealthfund.org/usr\\_doc/Shaller\\_patient-centeredcarewhatdoesittake\\_1067.pdf?section=4039](http://www.commonwealthfund.org/usr_doc/Shaller_patient-centeredcarewhatdoesittake_1067.pdf?section=4039).

Sprow, R. 2012. *Planning Hospitals of the Future*, AIA.  
Accessed March 15, 2015,  
<https://www.google.rs/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB0QFjAA&url>.

Trivic, Z., Bozovic-Stamenovic, R., & Hee, L. 2009. *The Role of Subjectivity and Seduction in Architectural Design*.

Vodička M. 1994. *Bolnice*, Zagreb, Školska knjiga, 65-129.

Wagenaar, C. 2010. *Architecture and health, Symposium*.  
Accessed March 30, 2015, <https://www.youtube.com/watch?v=e7mlaiVovFw>.